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## (54) A METHOD AND APPARATUS FOR PRODUCING WRAPPED FOODSTUFF IN A SINGLE SLICE FORM AND FOODSTUFF SO WRAPPED


(71) We, KUREHA KAGAKU KOGYO KABUSHIKI KAISHA, a Japanese Company, of No. 8, Horidome-cho, 1-chome, Nihonbashi, Chuo-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—


This invention relates to a method and apparatus for producing individually wrapped foodstuff in a single slice form.

It is known to produce wrapped packages containing foodstuff such as cheese in single slice form by extruding the foodstuff through an extrusion nozzle whose outlet orifice has a cross-section corresponding to that of the desired slice ie. slit-like, and wrapping the "slice" so produced. Unless the context otherwise requires, the term "slice" is used in this Specification to refer to a coherent mass of foodstuff which is thin relative to its other dimensions, so as to resemble the result of a slicing operation. However, this method has not proved to be wholly successful because the foodstuff, being of relatively high viscosity, tends to clog the extrusion orifice. Moreover, slices of different thickness can be obtained only by replacement of the extrusion nozzle which is a time-consuming operation. In addition, according to such a method, it is difficult to control the weight of an individual slice.

In accordance with one aspect of the present invention there is provided a method for the continuous production of wrapped packages containing foodstuff in single slice form, as hereinabove defined, from foodstuff which is extrudable and compressible at a temperature at which the foodstuff is not degraded, which comprises the steps of

(a) continuously extruding a mass of foodstuff through an orifice whose vertical dimension is large compared with the desired slice thickness into an endless tube of sealable wrapping material;

(b) compressing the extrudate within the tube of wrapping material so as to form a flat strip of wrapped foodstuff;

(c) further compressing said flat strip at lateral zones spaced apart in the longitudinal direction of said strip so as to express the foodstuff from said zones and bring opposed faces of said wrapping material at said zones substantially into contact, thereby forming discrete and separated lengths of wrapped foodstuff;

(d) simultaneously with or subsequently to step (c) compressing said discrete lengths of foodstuff so as to form wrapped slices of desired dimensions;

(e) simultaneously with or subsequently to step (d) sealing the opposed faces of the wrapping material to one another in said zones between said discrete lengths so as to produce individual sealed packages comprising foodstuff in slice form; and

(f) simultaneously with or subsequently to step (d) severing the wrapping material in said zones so as to separate the packages.

In accordance with a further aspect, the present invention provides apparatus for the continuous production of wrapped packages containing foodstuff in single slice form, as hereinabove defined, from foodstuff which is extrudable and compressible at a temperature at which the foodstuff is not degraded, which apparatus comprises

(i) an extruder for the foodstuff having an extrusion orifice whose vertical dimension is large compared with the desired slice thickness;

(ii) supply means for supplying an endless tube of sealable wrapping material around said orifice for extrusion of the foodstuff thereinto;

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(iii) first compression means for compressing extrudate within the tube of wrapping material to form a flat strip of wrapped foodstuff;

(iv) second compression means for compressing the flat strip at lateral zones spaced apart in the longitudinal direction of said strip to express foodstuff from said zones and bring opposed faces of said wrapping material at said zones substantially into contact, thereby to form discrete and separated lengths of wrapped foodstuff;

(v) third compression means for compressing said discrete lengths of foodstuff so as to form wrapped slices of desired dimensions, said third compression means being operable simultaneously with or subsequently to said second compression means;

(vi) sealing means for sealing the opposed faces of the wrapping material to one another in said zones between said discrete lengths of foodstuff so as to produce individual sealed packages comprising foodstuff in slice form, said sealing means being operable simultaneously with or subsequently to said third compression means; and

(vii) severing means for severing the wrapping material in said zones so as to separate the packages, said severing means being operable simultaneously with or subsequently to said sealing means.

The present invention permits the use of extrusion nozzles whose outlet orifices can be shaped so as to minimize or avoid altogether the risk of clogging by the foodstuff being extruded. Orifices of substantially circular cross-section are preferred. Moreover, slices of different thicknesses can be produced without the need to change the extrusion nozzle by the simple expedient of controlling the compression forces to which the extruded foodstuff is subjected. The apparatus of the present invention can be readily adapted to that end.

A wide variety of foodstuffs can be packaged in single slice form by means of the present invention. All that is necessary is that the foodstuff should be extrudable and compressible, if not at room temperature then at a temperature which does not adversely affect the quality of the food. If necessary, suitable heating and/or cooling means may be provided. The invention has particular applicability to packaging cheese and cheese-containing products.

It is preferred to use heat-sealable wrapping materials, but this is not obligatory and, for example, pressure-sealable materials could be employed.

A problem which can be encountered in packaging sliced foodstuff is that when the completed packages are laid one on top of the other, the foodstuff can be broken or cracked due to the presence at a zone intermediate the edges of the slice of a double thickness of wrapping material where the wrapping material is lap-joined. The method and apparatus of the present invention can be readily adapted to produce a final package in which the overlapped inner edge of the wrapping material is aligned with an edge of the slices. The slice of foodstuff in such a package is less likely to be damaged when stacked or unwrapped.

The invention will now be described further with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side elevation of a preferred embodiment of the apparatus of the present invention;

Fig. 2 is a partially fragmented longitudinal cross-section on a larger scale of a part of the apparatus shown in Fig. 1;

Fig. 3 is a partially fragmented longitudinal cross-section of a further part of the apparatus shown in Fig. 1;

Fig. 4 is a perspective view of the wrapped foodstuff at an intermediate stage of the packaging operation;

Fig. 5 is a perspective view of the final package;

Fig. 6 is a cross-sectional view taken along the line A—A of Fig. 5; and

Fig. 7 is a cross-sectional view similar to that of Fig. 6 but showing wrapped foodstuff of a single slice form produced by the prior art.

Referring now to Fig. 1, foodstuff 1 which is extrudable and compressible, for instance processed cheese or cheese food, is placed into a hopper 2 and then continuously fed to an extrusion nozzle 4 by means of a pump 3. The nozzle 4 is not of a type which has a slit-like opening for the direct extrusion of a slice but rather its extrusion orifice is of circular cross-section and of a diameter sufficiently large to avoid the possibility of binding of the food material within the nozzle even after a long stand still period. As shown in Fig. 3, the nozzle 4 is of a double walled construction, to permit temperature control.

The nozzle 4 is inserted into a tubular wrapping film 5 which has been formed from a strip of the film. In this respect, a film holder 6 and a sealer 7 can be adjusted such that the seam portion 8, shown in Figs. 5 and 6, is located at a required position, for instance, adjacent an outermost edge of the wrapped slice. This consideration aids in preventing the slice from breakage or cracking when the wrapping film is opened or when many of such wrapped products are laid one on top of the other. More particularly, if the overlapping end portion of the film is positioned inwardly of the slice, then the slice could be subjected to cracking due to bending when unwrapped, or when laid one on top of the other cracking could incur due to the built-up overlapping portions of the film. Accordingly,

the overlapping portion of the film should preferably be located as close to the outermost edge of the wrapped slice as possible.

The strength of the film seal should be minimized so as to facilitate opening of the package of the slice such as by just pulling the free end of the film, but of course the integrity of the seal should not be jeopardized.

Subsequently, the tubular film 5 filled with extruded food material 1 is then fed between at least one pair of press rolls 9 for compression to a strip form in which the food material therein is maintained in intimate contact with the inner surface of the film, as best seen in Fig. 3. The spacing between the two rolls 9 can be adjusted in conjunction with the pressure of a molding device 10 to be described hereinafter, such that the weight and thickness of a single slice is determined thereby. In addition, the temperature at the roll surfaces is also controllable. These press-rolls 9 serve not only to give the material a strip form but also to transfer the strip thus formed to the next stage.

The food material of a strip form 11 from the rolls 9 is then press-molded to a desired shape by means of a molding device 10. More specifically, this molding device comprises a plurality of molding frames 12 mounted on two moving endless conveyor belts 24 the inner runs of which are parallel and placed in opposed relationship to each other. The belts are arranged to move in synchronism such that each corresponding molding frame on each run of the belts comes into matching contact between the inner runs thereof. These molding frames each have a projecting wall upstanding from the base of the frame, so that when moving through the inner runs of the belts, the outermost ends of the projecting walls are not only in register but also make contact to thereby squeeze the wrapped food material to eventually express the same from lateral zones 13 which then form portions interconnecting the single slices.

As best shown in Fig. 2, a press plate 14 is housed in each upper molding frame 12 and has a stem extending therefrom through an opening outwardly of the molding frame 12. The press plate is adapted for reciprocal movement guided by the side walls of the molding frame 12 and is so designed to engage a cam (not shown) to thereby be urged against the top surface of the wrapped food material within the mold cavity defined by the co-operating pairs of molding frames. This operation ensures the formation of a foodstuff of a slice form having uniform thickness and an exact shape, eg. a square configuration. In this respect, the weight and the thickness of the single slice obtained is governed by the spacing of the rolls 9 and by the molding device 10. The compression means formed by the co-operating upstanding walls of the respective pairs of molding frames are functionally independent of the press-molding means formed by the press-plates 14, and therefore the travel of the press-plate 14 along the side walls of the frame 12 can be freely adjusted.

At this stage, the wrapped single slices interconnected to each other by the zones 13 are as shown in Fig. 4. They are next transferred from the press-molding device 10 on to a net type conveyor 15, for cooling if necessary. For example, water at a temperature from 0° to 5°C. can be sprayed from nozzles 16 against the underside of the wrapped slices. The temperature and duration of any such cooling step are dependent on the type of foodstuff. Alternatively, another type of cooling means may be used. However, the cooling means illustrated avoids the need to immerse the wrapped food material in water, and thus avoids the danger of water permeating into the interior of the package, while providing the further advantage of a reduced drying time. Preferably, the speed of the wrapped foodstuff at this stage should be different from that of the conveyor 15, so as to reduce the danger of the net pattern being formed on the surface of the slices, which would spoil their appearance.

The foodstuff thus cooled is then introduced onto a drying conveyor 17, where any water droplets on the surface of the wrapping material is blown out from above and below by air jets from air nozzles 18 eg. at a pressure of from 5 to 7 kg/cm$^2$.

In the next step, the interconnecting portions 13 are severed. For example, they may be heat-cut by means of a rotary heated sealer and cutter 19 heated to above melting point of a heat-sealable synthetic resin film used as the wrapping material 5. The cut and sealed edges of the film provide complete sealing without a so-called ear portion, i.e., without the remaining free edges of the overlapped and sealed portion of the film which do not adhere to each other. However, for sealing the interconnecting portion 13, any other type of sealing device may be used, and likewise other cutting devices can be employed. Alternatively, the heating means may be mounted on the molding frame 12, so that the sealing operation can be accomplished simultaneously with the press-molding.

The individual packages 20 each containing a single slice of the foodstuff are now fed into a chute 21 one after another and stacked in a pile, followed by transfer by means of a pusher 22 onto a delivery conveyor 23. The final package is shown in Figs. 5 and 6.

As is apparent from the foregoing description, the method and apparatus of the present invention do not need to utilize a nozzle having a narrow slit extrusion orifice but rather there is used the combination of a nozzle having a large eg. round opening, and com-

pression steps to control the weight and thickness of the individual slices and at the same time avoid clogging of the extrusion nozzle.

Furthermore, the apparatus of the present invention does not incorporate any complicated conventional slicing means and it does not require the replacement of the extrusion nozzle when a change in the thickness of the slices is required.

Preferably, the packaging operation is so conducted that the final package is as shown in Figs. 5 and 6 rather than as shown in Fig. 7. Referring to Figs. 6 and 7, it will be seen that in the preferred package, the tube of wrapping material which has been formed by overlapping opposite edges 33 and 34 of a sheet 32 of wrapping material and sealing at 35 is so disposed relative to the slice 31 of foodstuff that the overlapped inner edge 33 is aligned with an edge of the slice 31. This arrangement avoids the direct contact of the edge of the overlapped end 33 of the film with the surface of the foodstuff itself, which is present in Fig. 7, thereby precluding the formation of a notch on its surface and hence a notch effect when unwrapped. This minimises the risk of breakage or cracking of the slices upon stacking or unwrapping.

WHAT WE CLAIM IS:—

1. A method for the continuous production of wrapped packages containing foodstuff in single slice form, as herein defined, from foodstuff which is extrudable and compressible at a temperature at which the foodstuff is not degraded, which comprises the steps of

(a) continuously extruding a mass of the foodstuff through an orifice whose vertical dimension is large compared with the desired slice thickness into an endless tube of sealable wrapping material;

(b) compressing the extrudate within the tube of wrapping material so as to form a flat strip of wrapped foodstuff;

(c) further compressing said flat strip at lateral zones spaced apart in the longitudinal direction of said strip so as to express the foodstuff from said zones and bring opposed faces of said wrapping material at said zones substantially into contact, thereby forming discrete and separated lengths of wrapped foodstuff;

(d) simultaneously with or subsequently to step (c) compressing said discrete lengths of foodstuff so as to form wrapped slices of desired dimensions;

(e) simultaneously with or subsequently to step (d) sealing the opposed faces of the wrapping material to one another in said zones between said discrete lengths so as to produce individual sealed packages comprising foodstuff in slice form; and

(f) simultaneously with or subsequently to step (d) severing the wrapping material in said zones so as to separate the packages.

2. A method as claimed in Claim 1, wherein the foodstuff is extruded and/or compressed at an elevated temperature, and wherein the method comprises the additional step of cooling the foodstuff subsequent to step (d).

3. A method as claimed in Claim 1 or Claim 2, wherein the extrudate is compressed in step (b) by press-moulding substantially to the desired slice dimensions.

4. A method as claimed in any preceding claim, wherein the opposed faces of the wrapping material are heat-sealed to one another in step (e).

5. A method as claimed in Claim 4, wherein steps (e) and (f) are performed simultaneously and wherein step (f) comprises heat-cutting of the wrapping material.

6. A method according to any preceding claim, wherein said tube of wrapping material has been formed by overlapping and sealing together opposed edges of a sheet of the wrapping material, and wherein steps (a)—(d) are carried out so that the overlapped inner edge of the wrapping material is aligned with an edge of the slices.

7. A method according to any preceding claim, wherein said foodstuff comprises cheese.

8. Apparatus for the continuous production of wrapped packages containing foodstuff in single slice form, as herein defined, from foodstuff which is extrudable and compressible at a temperature at which the foodstuff is not degraded, which apparatus comprises

(i) an extruder for the foodstuff having an extrusion orifice whose vertical dimension is large compared with the desired slice thickness;

(ii) supply means for supplying an endless tube of sealable wrapping material around said orifice for extrusion of the foodstuff thereinto;

(iii) first compression means for compressing extrudate within the tube of wrapping material to form a flat strip of wrapped foodstuff;

(iv) second compression means for compressing the flat strip at lateral zones spaced apart in the longitudinal direction of said strip to express foodstuff from said zones and bring opposed faces of said wrapping material at said zones substantially into contact, thereby to form discrete and separated lengths of wrapped foodstuff;

(v) third compression means for compressing said discrete lengths of foodstuff so as to form wrapped slices of desired dimensions, said third compression means being operable simultaneously with or subsequently to said second compression means;

(vi) sealing means for sealing the opposed faces of the wrapping material to one another in said zones between said discrete lengths of foodstuff so as to produce individual sealed packages comprising food-

stuff in slice form, said sealing means being operable simultaneously with or subsequently to said third compression means; and

(vii) severing means for severing the wrapping material in said zones so as to separate the packages, said severing means being operable simultaneously with or subsequently to said sealing means.

9. Apparatus according to Claim 8, wherein said extrusion orifice is substantially circular in cross-section and forms the outlet of an extrusion nozzle adapted to be supplied with foodstuff from a supply hopper by means of a pump.

10. Apparatus according to Claim 8 or Claim 9, wherein said supply means comprises a device for forming the tube of wrapping material by overlapping and sealing together opposed edges of a sheet of the wrapping material.

11. Apparatus according to any one of Claims 8—10, wherein said first compression means comprises at least one pair of press-rolls.

12. Apparatus according to any one of Claims 8—11, wherein said second compression means comprises a pair of parallel endless conveyors mounted one above the other and each carrying a plurality of spaced apart, laterally-disposed compression members adapted to co-operate with the compression members on the other conveyor, said conveyors being movable in synchronism whereby in turn each compression member on one conveyor is adapted to be brought for a period into contact with a compression member on the other conveyor to thereby bring the opposed faces of the wrapping material into contact at the laterally spaced apart zones when, in operation, said flat strip of wrapped foodstuff is introduced between said conveyors and parallel thereto.

13. Apparatus according to any one of Claims 8—12, wherein said third compression means comprises a series of reciprocably movable press-plates.

14. Apparatus according to Claim 13 when appendant to Claim 12, wherein each said compression member is the upstanding wall of a molding frame carried by said conveyors, and wherein each said molding frame of the upper conveyor houses a press-plate reciprocably movable therewithin in co-operation with cam means whereby, in operation, the press-plates compress said discrete lengths of foodstuff against the molding frames of the lower conveyor.

15. Apparatus according to any one of Claims 8—14, for use with heat-sealable wrapping material, wherein said sealing means is a heat-sealer.

16. Apparatus according to any one of Claims 8—15, wherein said severing means is a heat-cutter.

17. Apparatus according to any one of Claims 8—16, including heating means for the foodstuff as it is being extruded and/or compressed and cooling means for the wrapped foodstuff.

18. Apparatus according to Claim 17 when appendant to Claim 9, wherein said extrusion nozzle is of a double walled construction.

19. Apparatus according to Claim 10 or any one of Claims 11—18 when appendant to Claim 10, wherein said compression means and said supply means are adapted to co-operate so that, in operation, the overlapped inner edge of the wrapping material is aligned with an edge of the slices.

20. A method for the continuous production of wrapped packages containing foodstuff in single slice form, as herein defined, substantially as hereinbefore described with reference to Figures 1—6 of the accompanying drawings.

21. Apparatus for the continuous production of wrapped packages containing foodstuff in single slice form, as herein defined, substantially as hereinbefore described with reference to Figures 1—6 of the accompanying drawings.

22. A wrapped package containing foodstuff in single slice form, whenever produced by a method according to any one of Claims 1—7 or 20, or by apparatus according to any one of Claims 8—19 or 21.

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1366798 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

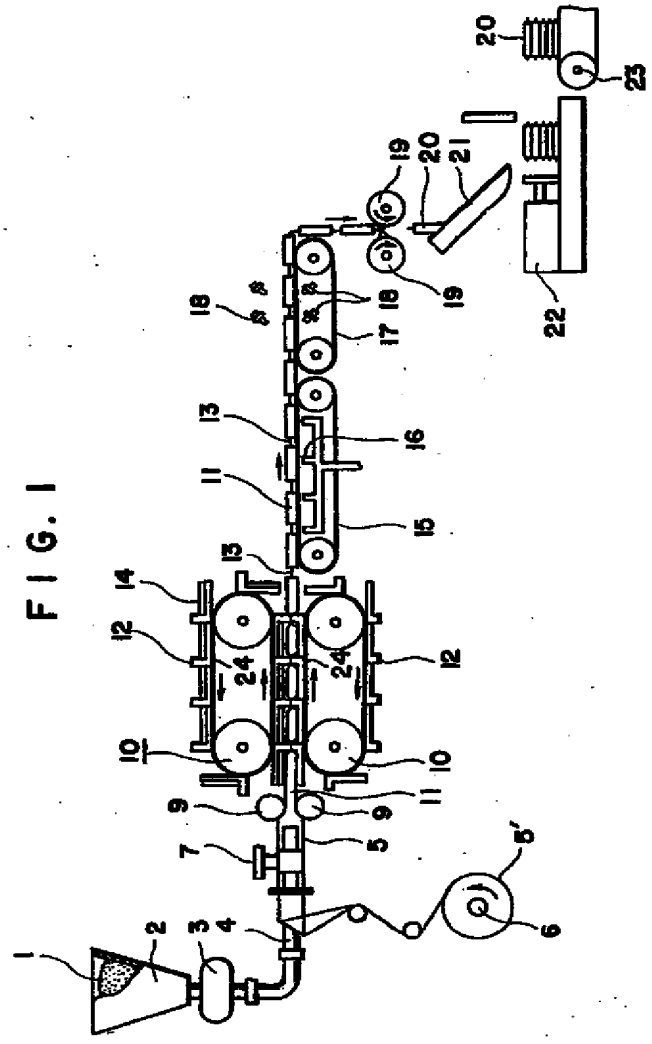



FIG. 1

FIG. 2

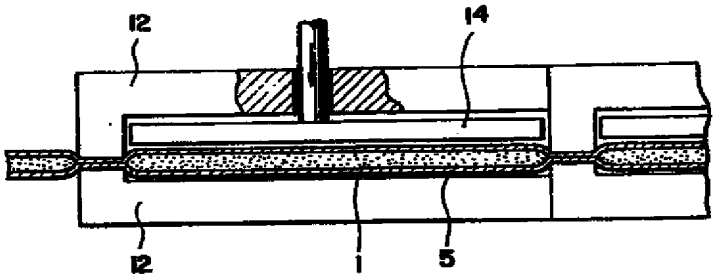
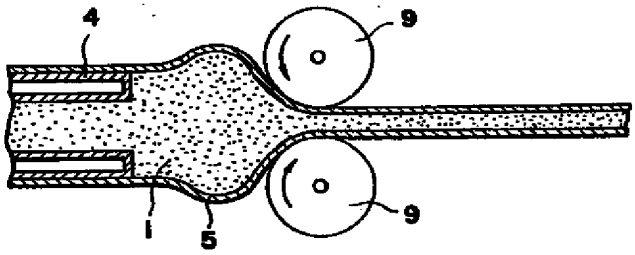



FIG. 3



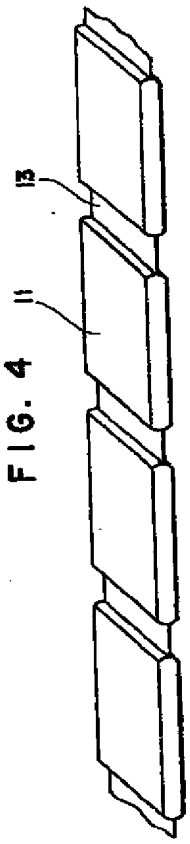



FIG. 4

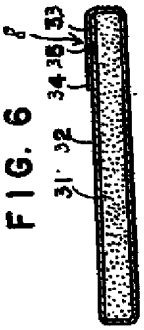



FIG. 6

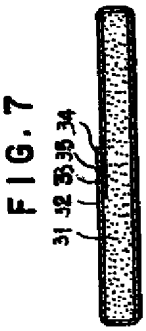



FIG. 7

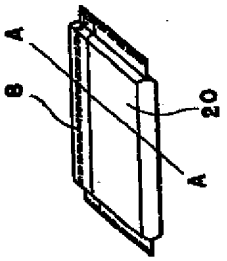



FIG. 5